



**Bachelor of Science (B.Sc.) Semester—II**  
**(C.B.S.) Examination**

**MATHEMATICS**

**Compulsory Paper—I**

**(M<sub>3</sub>—Geometry, Differential and Difference Equations)**

Time—Three Hours]

[Maximum Marks—60

**N.B. :—** (1) Solve all the **FIVE** questions.

(2) All questions carry equal marks.

(3) Question Nos. 1 to 4 have an alternative. Solve each question in full or its alternative in full.

**UNIT—I**

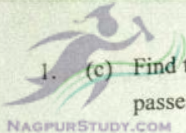
1. (a) Obtain the equation of sphere having the circle  
 $x^2 + y^2 + z^2 + 10y - 4z - 8 = 0$ ,  $x + y + z = 3$   
as the great circle. 6

- (b) Find the two tangent planes to the sphere  
 $x^2 + y^2 + z^2 - 4x + 2y - 6z + 5 = 0$

which are parallel to the plane

$$2x + 2y = z. \quad \quad \quad 6$$

**OR**



1. (c) Find the equation of the right circular cone which passes through the point  $(1, 1, 2)$  and has its vertex at the origin and axis  $\frac{x}{2} = \frac{-y}{4} = \frac{z}{3}$ . 6

- (d) Find the equation of the right circular cylinder of radius 2, whose axis passes through  $(1, 0, 3)$  and has direction cosines proportional to  $(2, 3, 1)$ . 6

## UNIT—II

2. (a) Show that the equation

$$(e^y + 1) \cos x \, dx + e^y \sin x \, dy = 0$$

is exact and hence solve it. 6

- (b) Solve the differential equation

$$(1 - x^2) \frac{dy}{dx} + 2xy = x(1 - x^2)^{1/2}. \quad 6$$

## OR

2. (c) Solve the differential equation

$$(x^2 + y^2)dx + xydy = 0$$

by finding integrating factor. 6

- (d) Solve the equation

$$p^3 + 2xp^2 - y^2p^2 - 2xy^2p = 0,$$

where  $p = \frac{dy}{dx}$ . 6

### UNIT—III

3. (a) Solve  $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x}$ . 6

(b) Solve  $(D^2 - 5D + 6)y = \cos 2x$ ,

where  $D \equiv \frac{d}{dx}$ . 6

OR

3. (c) Solve  $(x^2D^2 - xD + 4)y = \cos(\log x)$ . 6

(d) Solve  $y^{(2)} + y = \sec x$

by the method of variation of parameters. 6

### UNIT—IV

4. (a) From the relation  $u_x = c_1 3^x + c_2 (-1)^x$ , derive a difference equation by eliminating the arbitrary constants  $c_1$  and  $c_2$ . 6

(b) Solve :

$$u_{x+2} - 7u_{x+1} + 10u_x = 12(u)^x. \quad 6$$

OR

4. (c) Solve :

$$u_{x+2} + u_{x+1} + u_x = x^2 + x + 1. \quad 6$$

(d) Solve :

$$u(x+1) - 2u(x) = \cos nx. \quad 6$$



## UNIT—V

5. (a) Show that the two spheres

$$x^2 + y^2 + z^2 + 6y + 2z + 8 = 0 \text{ and}$$

$$x^2 + y^2 + z^2 + 6x + 8y + 4z + 20 = 0$$

are orthogonal.

1½

(b) Define the right circular cone.

1½

(c) Reduce the differential equation

$$\frac{dy}{dx} - \frac{1}{x}y = -x^2y^2 \text{ to the linear form.}$$

1½

(d) Solve :

$$p = \log(px - y), \text{ where } p = \frac{dy}{dx}.$$

1½

(e) Solve :

$$(D^2 + 1)y = 0, \text{ where } D \equiv \frac{d}{dx}.$$

1½

(f) Find the particular integral of

$$(D^2 - 4)y = e^{2x}.$$

1½

(g) Solve :

$$u_{x+2} - 4u_x = 0.$$

1½

(h) Define the difference equation. Find the order of the difference equation

$$u_{x+3} - 6u_{x+2} + 5u_{x+1} - 2u_x = 0.$$

1½